REMARKS

The Office Action dated October 3, 2003, was carefully reviewed. Claims 30-37 have been withdrawn from consideration. The election of invention I, claims 1-29 and 38-40, is affirmed herein as requested by the Examiner. It is respectfully requested the Examiner reconsider the present application in light of the remarks herein.

The Examiner rejected claims 1-4, 6-17, 26-29 and 38-40 under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 6,459,765 to Ganin et al., hereinafter Ganin. It is respectfully asserted that the present invention is not anticipated by the Ganin reference.

Independent claim 1 of the present invention requires the step of overlaying the pre-shot image with an overlay having a predefined configuration to define the region of interest. Independent claim 38 requires the steps of selecting a default region-of-interest configuration and correcting the pre-shot image by selecting divisions in the default region-of-interest configuration. According to the present invention the configuration is overlaid onto the image, whereby all or a portion of the configuration is selected to indicate a region of interest for the subsequent images.

The Ganin reference does not teach or disclose this aspect of the present invention. The Ganin reference discloses a rectangular region of interest. The Ganin reference discloses identifying a region of interest using complex algorithms to segment the image and locate a particular region of interest for the image. The

Ganin reference does not teach or disclose overlaying the pre-shot image with an overlay having a predefined configuration to define the region of interest as claimed by the applicants of the present invention.

It is respectfully requested the Examiner withdraw the rejection of claims 1-4, 6-17, 26-29 and 38-40 under 35 U.S.C. § 102.

The Examiner rejected claim 5 under 35 U.S.C. § 103 as being unpatentable over Ganin in view of U.S. Patent No. 6,233,473 to Shepherd et al., hereinafter Shepherd. The Examiner also rejected claims 18-25 as being unpatentable over Ganin in view of U.S. Patent NO. 6,325,537 B1 to Watanabe. It is respectfully asserted that the present invention is patentable over the references cited by the Examiner.

The present invention is directed to the problem of determining optimal exposure levels for patients having differing physical characteristics. Improperly exposed images require a retake of the x-ray, which results in an increased dose of radiation to the patient and extra cost to the service provider.

The present invention overcomes this drawback by proposing an automatic exposure control for a digital image acquisition system that predicts the appropriate exposure technique parameters for an x-ray image. The present invention uses a low-dose pre-shot image and virtual ion chambers to select and control the diagnostic exposure to be imaged in a subsequent shot. According to the present invention an overlay having divisions therein is selected and overlaid onto a pre-shot image to define a region of interest for the subsequent images. The overlay

defines the region of interest by any configuration, or combination, of shapes and sizes within a given x-ray image.

In the present invention, the region of interest is identified by selecting a configuration using a matrix of N x M simple geometric shapes, where the configuration is applied to the pre-shot image and used to define a region of interest. The divisions of the overlay are any shape and size and are selected to optimally define the region of interest.

The Ganin reference is directed to an automatic exposure control system that maintains a quality image while minimizing patient exposure to radiation. The Ganin reference proposes an x-ray system for exposure control that generates data of interest within the detector data to adjust the technique and/or dosage of radiation.

To accomplish this objective the Ganin reference teaches utilizing a pre-shot image to identify regions of interest. The regions of interest are determined by calculation, using image-based algorithms that take a plurality of parameters into account. Patient size, anatomy, and dose are some of the parameters used in the calculations used to define the region of interest. Column 4, lines 44-56, describes the analysis used to determine the regions of interest.

This is significantly different from the present invention. The present invention does not utilize algorithms to identify regions of interest. The present invention applies an overlay, which is pre-configured for the patient size, anatomical view, orientation, pathology, and system geometry, to define regions of interest. For example, a set of default overlay configurations may be applied to the x-ray system. The configurations may be stored in a database as a set of image masks. The image

masks can be developed based on a representative population base for each exam type, or they may be adjusted to suit particular preferences.

Further, using the preconfigured overlay taught by the present invention, adjustments can be made to the image masks ahead of time to customize the exam. Each region of interest can be pre-selected from the matrix and weighted with a unity-normalized value or by using half-tone percentages.

The Shepherd reference is directed to using x-rays to determine internal characteristics of patients or objects. Shepherd teaches an approach to body composition analysis that takes into account apparent changes in measured mass with the changes of location of the mass along raypaths from an x-ray source to an x-ray detector. Shepherd teaches collimating an x-ray into a fan shaped distribution. Shepherd does not teach triangular subdivision of a region of interest. Nor does Shepherd teach applying an overlay having triangular subdivisions to define a region of interest.

Ganin does not teach or disclose applying an overlay to define a region of interest. Shepherd does not teach subdividing the overlay into triangular sections. Therefore, the combination of Ganin and Shepherd cannot result in the application of an overlay having triangular subdivisions to a pre-shot image to define a region of interest as claimed by the applicants of the present invention.

Further, merely combining Ganin and Shepherd would not result in the applicants' invention. The combination of Ganin's automatic exposure control with the fan shaped x-ray beam of Shepherd would not result in an automatic exposure

control system that utilized a predefined overlay configuration to define a region of interest as taught by the applicants of the present invention.

Claims 18-25 of the present invention teach adjusting the geometry of the divisions in the overlay to further define a region of interest. The Watanabe reference is directed to limited range of movement of a traditional C-shaped x-ray arm. Watanabe teaches an x-ray generator and an x-ray detector that have variable position/direction to optimize the x-ray through the center of a region of interest. The Watanabe reference does not teach or disclose defining a region of interest as taught by the applicants of the present invention.

It is respectfully asserted that one skilled in the art would not look to combine the Ganin and Watanabe references to accomplish the applicants' invention. The Ganin reference does not teach or disclose applying a predefined overlay to a pre-shot image to define a region of interest, nor does the Watanabe reference teach or disclose altering the shape of a division in an overlay to further define a region of interest. Therefore, the combination of Ganin and Watanable does not disclose this aspect of the present invention.

It is respectfully requested the Examiner withdraw the rejection of claim 5 and claims 18-25 under 35 U.S.C. § 103.

Should the Examiner have any questions or comments, he is respectfully requested to call the undersigned attorney.

Respectfully submitted,

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